



U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: **ACTION**: Review and Concurrence, Equivalent Level of
Safety Finding for Boeing 767 Tanker/Transport Combi
Passenger Emergency Exit Arrangement

Date: April 9, 2003

FAA Project Number ST3073-T

From: Manager, Airframe/Cabin Safety, ANM-115

Reply to
Attn. of: Gary Park, ACE-118W,
316-946-4123

To: Joel M. Ligon, FAA Program Manager, ACE-117W

ELOS ST3073WI-T-A-1
Memo#:

BACKGROUND:

The Boeing Wichita Development and Modification Center Designated Alteration Station (DAS) has applied for a series of Supplemental Type Certificates (STCs) from the FAA Wichita ACO to modify a 767-200 Passenger airplane to a 767-200 Tanker / Transport. The main deck of the 767-200 Tanker / Transport is being offered to customers in three distinct configurations: all Passenger, all Freight, and Combi (a combination passenger and freight version). Boeing has requested an Equivalent Level of Safety (ELOS) Finding for § 25.807 at Amendment 25-88 for the 767-200 Tanker / Transport in the Combi Configuration. Section 25.807(g)(8), for an airplane with two pairs of emergency exits would require an airplane configured with a pair of Type A passenger emergency exits to also have a pair of Type C or larger exits. Additionally, per paragraph 25.807(e), exits must be distributed as uniformly as practical. AC 25.807.1 guidance recommends that airplanes which have passengers seated forward of the first exit, the capacity of the forward zone should not exceed 75 percent of the rating of the single pair of exits bounding the zone. An ELOS to § 25.807(g)(8) would allow the passenger cabin of the Tanker / Transport Combi configuration to be modified to add the previously designed and certified 767-300/400ER Type I emergency exit doors in lieu of the Type C or larger exit. The proposed emergency exit arrangement for the Combi arrangement includes two Type A and two Type I doors. The applicant maintains this arrangement is capable of evacuating 155 passengers [sum of maximum passenger ratings of 110 for the Type A and 45 for the Type I exit pairs per 14 CFR 25.807(g)] within the 90-second limit of 14CFR 25.803. Applying a 110-passenger limit will provide a level of safety at least equivalent to, or better than that provided by the requirements of §§ 25.807(e) and 25.807(g)(8). The ELOS Finding being sought would apply only to the Combi configuration.

APPLICABLE REGULATIONS: §§ 25.803, 25.807

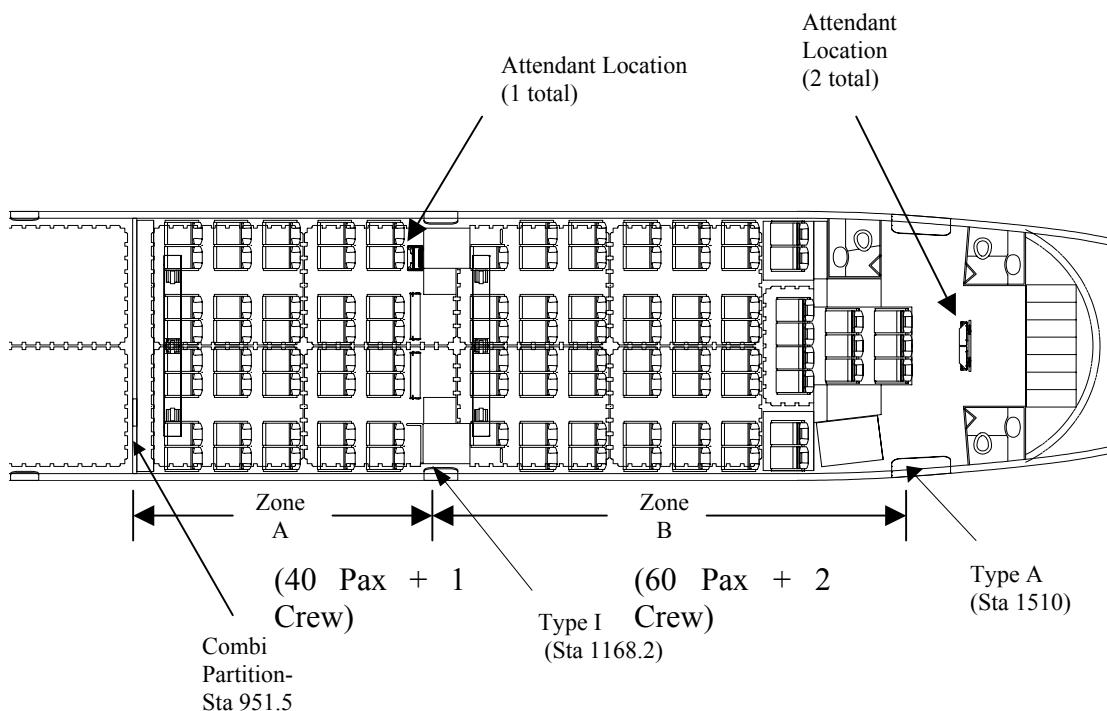
REGULATION REQUIRING AN ELOS: § 25.807(e) and § 25.807(g)(8)

DESCRIPTION OF COMPENSATING DESIGN FEATURES OR ALTERNATIVE STANDARDS, WHICH ALLOW THE GRANTING OF THE ELOS:

Applying a 110-passenger limit will provide a level of safety at least equivalent to, or better than provided by the specified requirements of § 25.807(g)(8).

EXPLANATION OF HOW THE DESIGN FEATURES OR ALTERNATIVE STANDARDS PROVIDE AN EQUIVALENT LEVEL OF SAFETY TO THE LEVEL INTENDED BY THE REGULATION:

The ELOS would not adversely affect the safety of this configuration because the cabin occupancy will be limited to 110 passengers by the design. The proposed emergency exit arrangement with two Type A and two Type I doors is capable of evacuating 155 passengers [sum of maximum passenger ratings of 110 for the Type A and 45 for the Type I exit pairs per 14 CFR 25.807(g)] within the 90-second limit of 14CFR 25.803. Applying a 110-passenger limit will provide a level of safety at least equivalent to, or better than that provided by the requirements of §§ 25.807(e) and 25.807(g)(8).



767 Tanker/Transport Combi Pax Emergency Exit Arrangement

Compensating Factors

1. The maximum seating capacity of the 767-200 Combi is proposed to be limited to 110 passengers (same as allowed with two pairs of Type C exits).
2. The 767-200 Combi will be configured with a pair of Type A and a pair of Type I emergency exits. By comparison to two pairs of Type C exits, the Type A and Type I combination has passenger egress capacity far in excess of that provided by two pairs of Type C exits (155 passengers v. 110 passengers).
3. The 767-300/400ER Type I exit is over-sized relative to the minimum dimensions specified in the regulations. It measures 24" x 60", 12 inches taller than the required 24" x 48" Type I exit dimensions. It is also worthy to note that the 767-300/400ER Type I exit has the identical area (1440 square inches) as the required dimensions of a Type C exit (30" x 48"), but the Type I exit is distributed in a taller/narrower configuration.
4. With regard to passenger egress rate, the existing 767-300/400ER Type I exit has been demonstrated to be equivalent to an average Type C exit. The 767 Type I door and assist means were demonstrated to have an egress rate of 62.9 PPM during a full scale evacuation demonstration conducted on a 767-300 airplane per the requirements of 14 CFR 25.803(c). A copy of Boeing document D926T0110, containing these FAA approved test results is enclosed with this position paper. The same door and assist means as tested will be installed in the same relative location on the 767 Tanker Transport Combi. Based on the existing FAA approved data the 14 CFR 25.803(c) egress rate of the Type I emergency exits as installed in the 767 Tanker Transport Combi cabin configuration would also be 62.9 PPM. Based on past Boeing egress tests the average Type C exit flow rate is 60 PPM. Therefore, based on this documentation of FAA certification test data, the 767 Type I exit performed equivalently to Type C sized exits under 14 CFR 25.803(c) conditions.
5. The passenger distribution with respect to the Type I and Type A exit arrangement has been evaluated in accordance with AC 25.807-1. The passenger compartment consists of a zone forward of the Type I door, Zone A, and a zone between the Type I and Type A doors, Zone B. The configuration of the combi aircraft creates a passenger zone with exits at only one end (a "dead end zone"). AC 25.807-1 guidance recommends that the maximum capacity of "dead end zones" to be equal to 75 percent of the rating of the associated exit doors. As the 767-300/400ER Type I exit has been shown to be equivalent to Type C exit rate requirements, and per the guidance of AC 25.807-1, the maximum allowed passenger capacity of Zone A would be 41 passengers ($55 * 0.75$). The proposed combi arrangement allows 40 passengers in Zone A, within AC 25.807-1 guidance. Per AC 25.807-1 guidance, Zone B capacity could not exceed 165 passengers. The proposed combi configuration allows only 60 passengers in Zone B.
6. The Type I and Type A combi exit locations have been evaluated with respect to their location to each other and the length of the combi passenger compartment. As the 767-300/400ER Type I exit has been shown to be equivalent to Type C exit rate, a Type C exit unit value has been applied for the Type I door. Applying the guidance of AC 25.807-1 the nominal exit locations are defined as STA 1106 and STA 1511 for the Type I and Type A

doors, respectively. (As seat selection has not been determined, it is assumed the first row seat tie down is located at STA 971 and is considered conservative.) The calculated nominal locations result in 11.5 % and 0.2 % offset for the Type I and Type A combi locations respectively, within the 15% offset guidance contained in AC 25.807-1.

7. The Type I exit assist means meets the same requirements as the Type C exit. 14 CFR 25.810 requires an assist means for each Type C exit. The 767-300/-400ER Type I exit has an escape slide that automatically deploys and inflates. The FAA approved test data (reference D926T0110) shows the Type I door slide was deployed within 10 seconds after opening the exit. This data is consistent with the requirements for Type C exit assist means per 14 CFR 25.810(a)(1)(ii).
8. The emergency exit arrangement requirements of 14 CFR 25.809, the emergency exit marking requirements of 14 CFR 25.811, and the emergency lighting requirements of 14 CFR 25.812 are identical for Type I and Type C exits and assist means. The passageway and assist space requirements of 14 CFR 25.813 are identical for Type I and Type C exits.
9. The expected evacuation time of the 767-200 Tanker/Transport in the Combi configuration with 110 passengers is approximately 65 seconds, thereby providing considerable time margin relative to the 90-second requirement contained in 14 CFR 25.803. Compliance with evacuation requirements listed in 25.803(c) will be verified by analysis.

Based on the above compensating factors, Boeing has determined that the 767-200 Combi with a pair of existing Type A and a pair of existing Type I emergency exits would not adversely affect safety if the maximum passenger count were limited to 110 passengers. With the 110-passenger limit in place, the grant of an ESF will provide a level of safety at least equivalent to, or better than that provided by the rule from which relief is being sought. Boeing's position is that the 767-200 Tanker/Transport Combi emergency exit configuration offers the best benefits to public safety while providing an equivalent level of safety to 14 CFR 25.807(e) and 25.807(g)(8).

The location of the added exit pair on the 767-200 Tanker/Transport in the Combi configuration is identical to the location of the exit pair on the 767-300 and -400ER relative to the wing. As such, the existing emergency exits and escape slides can be used with no additional (and unnecessary) development, qualification and certification costs.

The 767 Type I exit meets all of the pertinent 14 CFR part 25 requirements for a Type C exit as shown above in compensating factors 4, 5, and 6, except for the dimensional requirements of 14 CFR 25.807(a)(9). The 767-300/400 Type I door has been shown to be equivalent to Type C exits under 14 CFR 25.803(c) full scale evacuation demonstrations as shown by FAA certification test data recorded in Boeing Document D926T0110.

It is Boeing's position that the pair of Type I and the pair of Type A exits on the 767 Tanker Transport in the Combi configuration will provide egress capability which is at least equivalent to that provided by two pairs of Type C exits, and thus provides an equivalent level of safety to that required by 14 CFR 25.807(g)(8) for the 110 passenger Combi configuration.

References:

- (1) 14 CFR 25.807(e), Amendment 25-88. "Exits must be distributed as uniformly as practical, taking into account passenger seat distribution."
- (2) 14 CFR 25.807(g)(8), Amendment 25-88. "If a Type A, Type B, or Type C exit is installed, there must be at least two Type C or larger exits in each side of the fuselage."

FAA POSITION:

The FAA concurs that the applicant's proposal provides for an equivalent level of safety, although the FAA does not necessarily agree with every issue discussed in the proposal. For example, the FAA does not necessarily agree that the performance of the Type I exit in demonstrations conducted on the 767 show equivalent performance to Type C exits in demonstrations on narrow body airplanes. The exit on the 767 is fed by up to three lines of evacuees while the Type C exits are fed by only one line of evacuees. Nonetheless the Type I exit did exhibit sufficient egress capability to achieve an equivalent level of safety for the subject interior.

Section 21.21(b)(1) requires "...that any airworthiness provisions not complied with are compensated for by factors that provide an equivalent level of safety..." With regard to Boeing's proposal and identification of Compensating Factors, items 1 – 9 above, the FAA concurs and finds an Equivalent Level of Safety to 14 CFR Parts 25.807(e) and 25.807(g)(8) for the 767 Tanker/Transport Combi Exit Arrangement.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding in issue paper A-1. This memorandum provides standardized documentation of the ELOS that is nonproprietary and can be made available to the public. The Transport Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis, ELOS section.

/S/

Franklin Tiangsing

Manager, Airframe/Cabin safety, ANM-115

Date: April 9, 2003

Originated by Wichita	Project Engineer: Gary Park	Routing Symbol ACE-118W
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